

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Creation of a Spectrum)	ET Docket No. 06-89
Sharing Innovation)	
Test-Bed)	

**REPLY COMMENTS

OF

MARCUS SPECTRUM SOLUTIONS**

Marcus Spectrum Solutions (MSS), an independent consulting firm specializing in wireless technology and spectrum policy, is pleased to respond to this important proceeding. Dr. Michael Marcus, the Director of MSS, played a key role in many spectrum decisions at FCC including the 2002 deliberations of the Spectrum Policy Task Force. In these comments MSS is acting in the public interest, not on behalf of a specific client. The Commission is aware of the qualifications¹ of Dr. Marcus.

MSS strongly supports the comments of Shared Spectrum Company that urge that the testing of cognitive radio technology be a major goal of the test-bed.

More specifically, MSS urges that “interruptible spectrum”, as described on p. 42-44 of the Commission’s *Spectrum Policy Task Force Report* be made one specific goal of the test-bed. While FCC has shown interest in this concept at the staff level and has explored the concept in Docket 03-108, NTIA has *never*

¹ See http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-243463A1.pdf

mentioned the topic in an official document and there is evidence that it discouraged FCC from even mentioning it in the context of Federal/non-Federal sharing.

What is Interruptible Spectrum?

Interruptible spectrum is a class of sharing schemes in which a “public sector”² user leases access to his unused spectrum to a private sector entity under the condition of instant and ultrareliable reversion of the spectrum to the public sector user when it is needed for emergency communications.³ Much of the “white space” in major urban areas comes from allocations to public sector users based on peak demands since most of these users have a high peak-to-average ratio, and thus have a low average spectrum utilization. This low average utilization is *not* bad. It is *not* a sign of inefficient radio system design. **It is the basic nature of emergency communications** in which the peaks have very high societal value so it is necessary to design systems with great attention to peak demands. But cognitive radio technology may be able to give us this same emergency service goal *and* get higher overall spectrum efficiency at the same time.

The comments of the public safety community in the *Cognitive Radio* rulemaking, Docket 03-108, show their real and legitimate concern about using unproven technology such as interruptible spectrum in public safety bands. The test-bed would be an ideal way to prove that this technology can work. NTIA’s historical disinterest in this topic *must* be matched by FCC explicitly seeking to include this as a goal. There is too much underutilized spectrum at stake. Increasing spectrum utilization can enable GDP and national productivity growth as well as allowing new business models that could lead to yet more economic growth. Hopefully these are goals that both the Commission and the Bush Administration can support even if the IRAC membership may have little interest in them.

While “interruptible spectrum” has often been raised in the context of private users getting access to public sector spectrum at times of low usage, it could also be used in balancing localized and time-varying imbalances between state and local public safety spectrum and Federal Government spectrum.

² “Public sector” is not standard spectrum terminology and is meant here to mean all local, state, and federal public safety-related spectrum users including military users.

³ Papers giving more details on interruptible spectrum are available at <http://intel.si.umich.edu/tprc/papers/2002/147/SpectrumMgmtReform.pdf> and <http://www.marcus-spectrum.com/documents/dyspan05.pdf>

The measurements⁴ taken by Shared Spectrum Company during the 2004 Republican National Convention in New York City highlight that even in times of preplanned high public safety concentration in a small area there are major disparities in spectrum utilization. For example, Figure 1 shows observed occupancy of the 138-174 MHz band shared between Federal Government and non-Federal Government users and the home to much public safety activity and the significantly lower occupancy of the 220-405 MHz Federal Government-only band. A detail of 360-365 MHz is shown to indicate that the 220-405 overview is typical of the whole band.

MSS urges FCC and NTIA to do more than designate a block a frequencies and a geographic area for the test-bed. In order to test whether cognitive radio systems and interruptible spectrum can really work, the test-bed should include simulated operational public sector traffic, perhaps from recordings of real operational traffic. The simulated traffic should cover both normal daily traffic loads and emergency peaks. The amount of spectrum involved need not be large. Even at 25 kHz/voice channel, 30 pairs would only be 1.5 MHz and would be adequate to test these concepts.

Some of this simulated traffic should be from trunked radio systems and experimenters in the test-bed should be able to request real time access to the data in the trunked system controller on:

- instantaneous channel use,
- traffic intensity and its time derivatives and
- expected frequencies to be assigned to the next requested channels.

The test-bed should have instrumentation that detects and records interference to the simulated public sector traffic and this information must be available to users of the test-bed.

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http://www.sharespectrum.com/inc/content/measurements/nsf/NYC_report.pdf

Conclusions

In summary, if properly implemented the test-bed could help foster innovative radio technology in the US as well as encouraging more intensive use of the radio spectrum to increase US GDP and productivity while not impacting critical Federal Government spectrum uses.

Specific suggestions are made for including in the test-bed provisions to test the feasibility of the interruptible spectrum technique proposed by the Spectrum Policy Task Force. The potential of this technique to contribute to increased spectrum utilization is so great that steps are needed now to see if legitimate concerns of public sector users can be satisfied.

Michael J. Marcus, Sc.D., FIEEE
 Director
 Marcus Spectrum Solutions
 55, rue Molitor
 F-75016 Paris France
mjmarcus@alum.mit.edu
members.aol.com/marcusspectrum

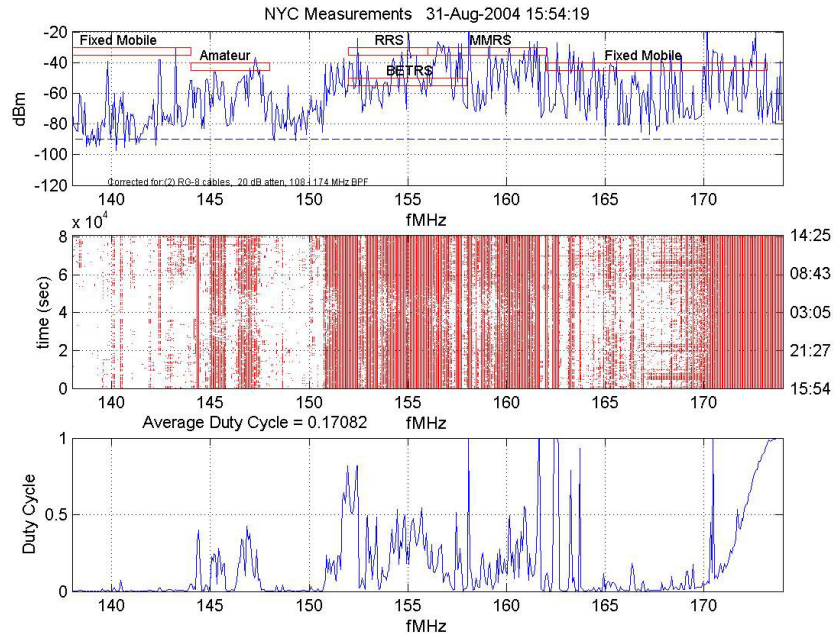
July 24, 2006

Figure 1: Comparison of Band Occupancies During 2004 Republican Convention in New York City

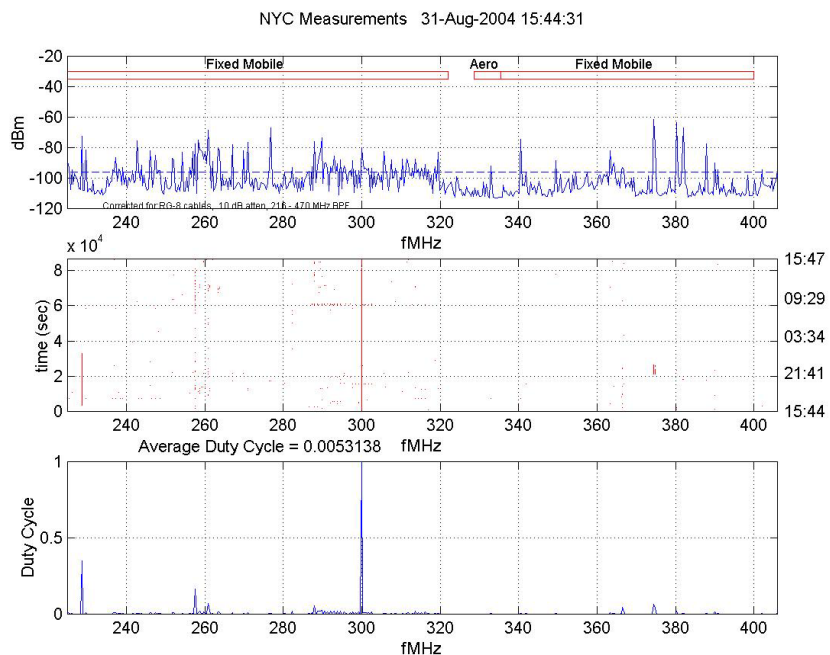
Source: Shared Spectrum Company

http://www.sharespectrum.com/inc/content/measurements/nsf/NYC_report.pdf

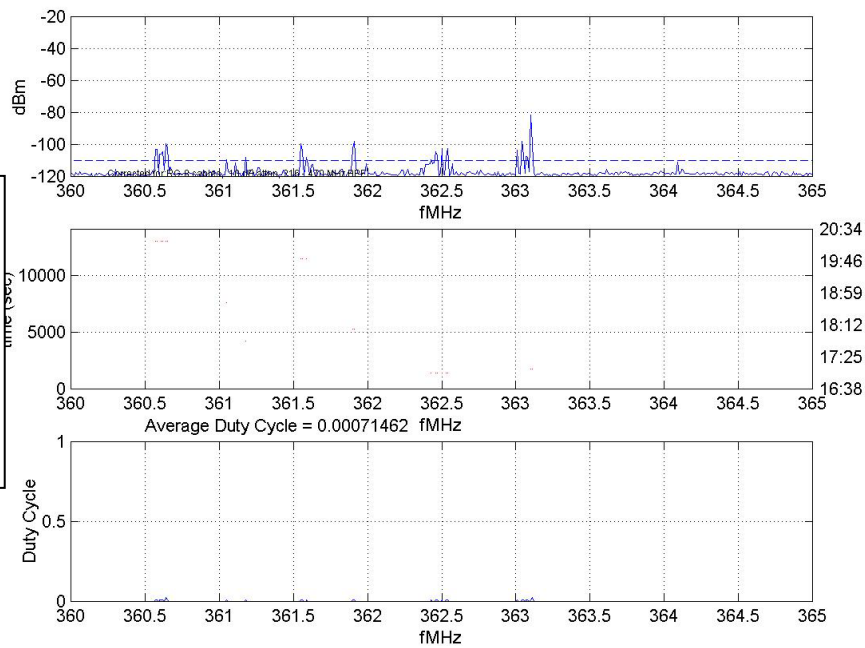
Heavy utilization in "high VHF" band shared by Federal Government and



Little utilization in Federal Government-only

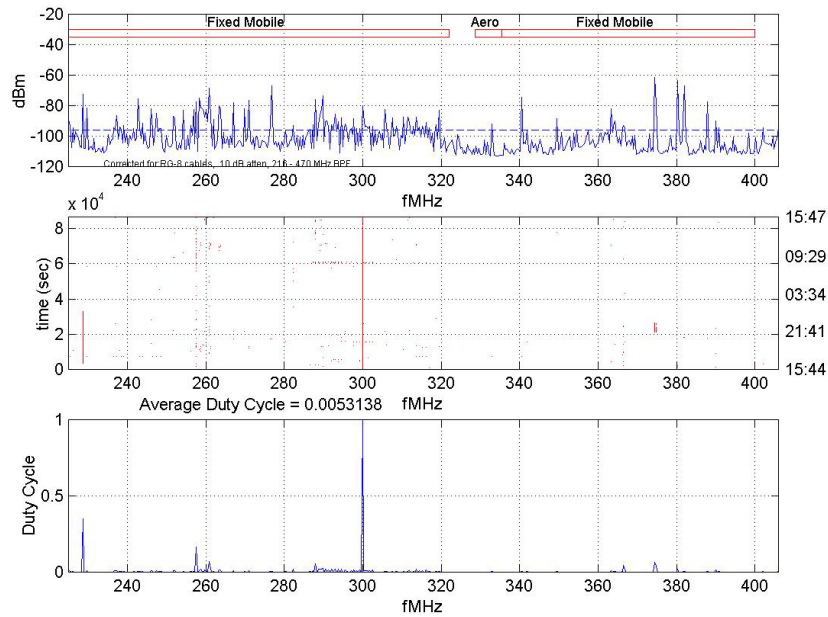


NYC Measurements - High Freq 01-Sep-2004 16:38:30



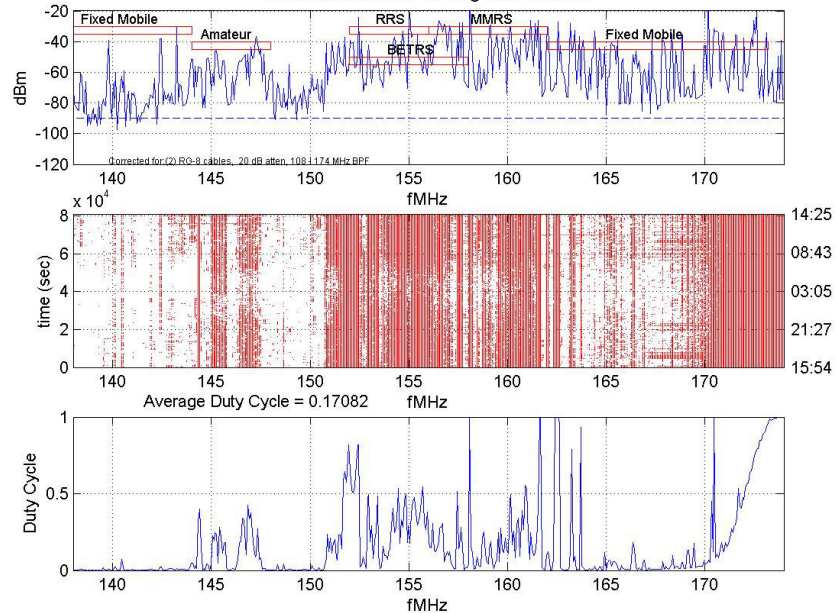
Detail of previous chart to show that more definition gives the same observation

NYC Measurements 31-Aug-2004 15:44:31



Little
utilization in
Federal
Government-only

NYC Measurements 31-Aug-2004 15:54:19



Heavy
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Federal
Government and